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BOVINE PYELONEPHRITIS*

BY

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Bovine pyelonephritis has been known for upwards of 100 years and recognised by the passage of turbid red urine during life and the enlarged diseased kidneys after death.

The aetiology of the disease is similar to that of most diseases in that there are contributory causes as well as a specific one.

(*a*) The bacterium almost invariably concerned is *Corynebacterium renale;* it is a large Gram-positive diphtheroid which grows easily on plain media and ferments glucose. Urea is readily attacked with the production of ammonia and may have a bearing upon the localisation of the organism in the kidney medulla. Colonies of *C. renale* are surrounded by a halo when grown on agar containing 10 per cent. milk (Lovell, 1946). The antigenic structure of strains of this bacterium has not been studied sufficiently to determine the differences which may occur, but most strains are serologically related as judged by precipitin tests. Agglutination tests are not easily performed because of the sensitivity of suspensions to salt. *C. renale* is pathogenic for a proportion of mice and rabbits (Lovell & Cotchin, 1946; Feenstra, Thorp & Gray, 1949) provided the dosage is sufficiently large; the lesions are similar to those developing in the natural disease in cattle.

(*b*) The subsidiary causes of pyelonephritis are more difficult to determine. The frequency of the disease in adult female cattle, and in association with parturition, has been recorded many times and it is a common sequel to retention of the afterbirth, metritis and vaginitis. It has therefore been assumed that the nephritis was secondary to a cystitis. Ritzenthaler (1910) studied the relationship between the time of parturition and slaughter due to pyelonephritis; the times varied in 20 cases from 12 days to 12 months. It is difficult to assign parturition as a contributory cause, although it is possible that an influence may be exerted at a particular stage, or that some abnormality may act accordingly. Pyelonephritis is rare in young stock, and the few records available suggest that an obstruction or abnormality in the urinary tract may serve as a subsidiary factor. A few cases of infection in calves were reported by Ritzenthaler, and they had a permeable or thickened urachus, or were suffering from a concurrent umbilical infection. These observations should be considered in conjunction with those concerning the recovery of *C. renale* from the vagina and urinary tract of healthy cattle. Jones and Little (1930) isolated the organism from the urinary tract of calves in an infected herd and Weitz (1947) recovered it from the vagina of 44 of 100 dairy cows. Several cases of the disease had occurred in one of the herds examined by Weitz and 31 of the 54 cows yielded *C. renale* at one examination. It is recognised that the more frequently such examinations are made the higher the number of carriers that are observed. *C. renale* is not easy to identify with certainty, but in spite of this it is a strong probability that this bacterium is carried by a high proportion of normal healthy cattle. The evidence suggests that infection may take place early in life and that development of disease occurs in a proportion of cattle only; the reasons for this discrimination are not clear.

The mode of infection and the route taken by the organism in the individual case is also questionable. The early German workers distinguished between the stage of infection, in which the bacteria pass down the convoluted tubules of the kidney and accumulate in the straight tubules, and the stage of abscess formation and necrosis of the kidney papillae. The fibrosis and the obstruction to the flow of urine by thickened ureters was regarded as the third stage. It was argued that *C. renale* has a predilection for urine and material containing urea, and that the infection was blood borne. Furthermore, frequently both kidneys were involved, and infection was difficult to effect by introduction of the bacteria into the bladder unless some irritant such as sand was added; even in such cases the disease was often transient. The opposing view, supported by French and some American authors, suggests that the bacilli reach the bladder by way of the urethra; they multiply there and pass up the ureters to the kidneys. The inability to reproduce the disease by intravenous inoculation and the frequency with which the disease followed parturition supported this view. Jones and Little (1926) were not able to infect rabbits, guinea-pigs or white mice with *C. renale;* cows failed to respond except when cultures were given into the urethra and a cystitis developed. Some years later it was reported (Lovell, 1946; Lovell & Cotchin, 1946) that mice could be infected with *C. renale* by the intravenous route, provided an adequate dose was given. A proportion of the mice died and there was a pyelonephritis which was associated with actual multiplication of the bacteria in the kidney tissue. Similar lesions may be produced in rabbits by the intravenous inoculation of very large doses (Feenstra *et al.*, 1949). *C. renale* has, therefore, a selective action on the kidney medulla of the mouse; lesions found in the medulla and bladder resemble those found in the natural disease in cattle. It is assumed that the sequence of events in cattle may be similar to the experimental disease in mice. The bovine kidney is lobulated, and the destruction of a papilla may correspond to an attack of renal colic; there is then an apparent improvement which lasts till another lobule is attacked. The localisation of bacteria in one specific type of tissue is not a new concept; the portal of entry in typhoid fever and bacillary dysentery may be the same, but the specific localisation of the bacteria differs. Efforts are being made to analyse the factors responsible for this selective action of *C. renale* for the kidney medulla. One approach made concerns the metabolism of the organism; the bulk of the ammonia production of *C. renale* is due to the enzyme

* Given before the Scottish Metropolitan Division, N.V.M.A., at Perth, June 13th, 1951.

urease, although other enzymes such as arginase and uricase may also be involved (Lovell & Harvey, 1950). There is little doubt that *C. renale* is a very powerful ammonia-producing bacterium, and prefers the medulla of the kidney to the cortex as a site for growth. Another study, which has the same object in view, concerns the effect of the intravenous inoculation of chemical extracts of *C. renale* into mice. Trueta *et al.* (1947) showed that blood reaching the kidneys may pass almost exclusively through one or other of two pathways; one pathway is through the cortical glomeruli and the other the juxta-medullary glomeruli. This second route, accompanied by a cortical ischaemia, may be induced by the stimulation of nerve endings, by severe and rapid haemorrhage and by the administration of certain drugs and of staphylococcal toxin. A cortical ischaemia of the kidneys of mice may be induced by the intravenous inoculation of chemical extracts of *C. renale*. This may be observed visually and recorded by the injection of a suspension of indian ink; the particles of indian ink are distributed throughout the medullary and juxta-medullary zone, the cortex being free (Lovell & Cotchin, 1951). It is probable that a nervous mechanism is involved and that in the natural disease there is an increased blood flow to the kidney medulla. The localisation of organisms in the medulla and papillae is facilitated by the preference of *C. renale* for tissue with a high urea content. The hypothesis that bovine pyelonephritis is haematogenous in origin is thus supported by experimental observations.

The pathogenesis of the disease is important from the angle of diagnosis and prognosis. Diagnosis is based largely on the passage of blood-stained turbid urine, and if the haematogenous route of infection is true then the prognosis is grave because renal damage is indicated. If on the other hand, the urogenous route obtains then early symptoms may indicate a cystitis alone which might yield to modern treatment. The evidence, unfortunately, favours the former view and the presence in the urine of blood, pus cells and *C. renale* most probably indicates actual and extensive damage to the kidney tissue. The demonstration of *C. renale* by films and by cultural methods makes diagnosis a relatively simple matter. Occasionally the disease may be confused with a chronic haematuria of unknown aetiology in which there are wart-like lesions in the mucosa of the bladder; there may be an anaemia but no specific bacteria are found in the urine.

The prognosis of specific cystitis and pyelonephritis is not favourable, although death may not always occur within a short time of the onset of symptoms. The disease may be protracted for months and periodically an infected animal may suffer from a transient illness accompanied by the passage of blood-stained urine. Infected cattle may make apparent recoveries only to show similar symptoms at a later date. These exacerbations may be associated with the destruction of a kidney lobule and it is unlikely that recovery ever occurs after damage to the kidney has taken place.

The treatment of specific pyelonephritis consists very largely of the administration of penicillin. It was expected that it would be of value as *C. renale* is sensitive to penicillin *in vitro* and the drug is excreted rapidly in the urine. If given early in the experimental disease in mice a high proportion of infected mice are protected; no advantage accrues if it is delayed from the third day of infection (Lovell & Cotchin, 1947). There may be histological evidence of kidney damage within 30 hours of the intravenous administration of *C. renale* into mice and therefore penicillin is unlikely to be of value in the natural disease in cattle. Until it is possible to diagnose the disease at a much earlier stage, specific treatment is probably of little value. Total amounts of 10,000,000 units of penicillin have been given to infected cattle over a period of eight to ten days and the general opinion held is that the symptoms may thereby disappear temporarily but that recurrence occurs in most cases. Some infected cattle can be salvaged and, though animals eventually die from the disease, economic considerations may make it worth while to treat selected cases.

It is difficult to apply methods of control which are adequate till more is known of the natural history of pyelonephritis. Morse (1950) gives an interesting account of its spread in an infected herd. *C. renale* was recovered from the urine of 10·2 per cent. of cattle in herds in which no clinical cases of pyelonephritis had occurred; the percentage carrier rate in herds containing clinical cases was 22·7. A survey was made of the carrier rate in a 100-cow dairy herd: five cows were detected at the first examination. Observations made over the succeeding 14 months showed that *C. renale* was recovered from urine and vaginal swabs of 51 cows on at least two occasions. The positions of the cows in their respective stalls suggested that *C. renale* was disseminated from the carrier cows to their close neighbours. Clinically affected animals appeared very dangerous and it is suggested that the brushes used for daily grooming may have acted as vehicles of infection.

Pyelonephritis in cattle should therefore be regarded as a contagious disease, and carriers of *C. renale* should be expected in herds in which cases of the disease have been observed. Little is known of the factors responsible for converting latently infected animals into overt cases of disease; some abnormality in the urinary tract is suspected. Pregnancy and parturition does not always act as a subsidiary cause, but the size and position of the foetus or inadequate cleansing may be sufficient to upset an equilibrium to the detriment of the host.

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Weekly Wisdom

A man shows what he is by what he does with what he has. The secret of life is not to do what you like but to like what you do.—Anon.

* * * * *

The Economic Poultry Unit

Mr. Alan Bell, Vice-Chairman of the Chick Producers' Association, speaking at a dinner held in connection with the first Scottish Conference of the Association, said that far too many people are still hoping to make a living from 500 birds, and, on top of this, making no special effort to encourage winter production. "We have got to think in terms of 2,000 to 3,000 birds as a one-man unit," he continued, "and adopt production methods to make this possible. We must face up to the fact that margins of profit are inevitably lower than a few years ago and may get lower still." Whilst instinctively disliking mass production, he admitted that it was the only way to succeed in egg, table poultry or chick production. The average size of unit was well below the economic number.—*Farmers' Weekly.*

THE PREPARATION OF GASTRIC POUCHES IN THE RUMINANT

BY

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Although a number of workers have carried out investigations on gastric secretion in the ruminant very few of them have described the operative technique they have used in preparing their animals. Belgowski (1912) provides, in fact, the only account of the actual preparation of an abomasal pouch (Pavlov) that we have been able to find in the literature. The purpose of this paper is to describe certain methods which have been developed and used in this laboratory for the preparation of abomasal pouches in goats and which may be of interest to other workers in this field.

Preparation of the Animal.—Adult female goats have been used throughout, food being withheld from the evening of the day preceding operation.

Anaesthesia.—The animal is anaesthetised by the Nembutal-Cyclopropane method described by Gregory (1947). As Phillipson and Innes (1939) point out, ruminants secrete large quantities of saliva and it is necessary, during anaesthesia, to keep the head of the animal inclined downwards to prevent saliva entering the respiratory tract. Regurgitation of ruminal ingesta, if it occurs, can be rectified by lifting the chest, leaving the head to hang down. When completely anaesthetised the animal is placed on its left side and the operation site clipped, shaved and swabbed with alcoholic iodine. Sterile drapes are placed so as to cover the animal completely except for the operation site and the head.

Post-operative Care.—During recovery from the anaesthetic the cannula should be protected with several swabs held in position by a body belt or by passing the cannula through a large rubber bung held up against the body wall. A prophylactic dose of polyvalent gas-gangrene antitoxin is given on completion of the operation. The cannula must be examined several times daily after the operation and the pouch carefully washed out with warm saline until gastric juice is being secreted. This prevents blood clots and cellular debris from blocking the cannula for long periods.

Regional Anatomy.—The abomasum of the goat resembles the stomach of the non-ruminant in shape, possessing a comparatively short, wide body region and a longer narrow pyloric region. Its blood supply is derived from the superior omaso-abomasal artery which passes along the lesser curvature in the omental fat and from the inferior omaso-abomasal artery which passes along the greater curvature. Numerous small branches are given off these arteries to both surfaces of the abomasum. The Right and Left Vagi pass over the surface of the omasum and on to the lesser curvature of the abomasum. Here they run in parallel, each giving off branches to the appropriate surface of the abomasum.

OPERATIVE TECHNIQUE

1. INNERVATED POUCHES

(*a*) *Orthodox Pavlov Pouch*

A 6-inch to 7-inch incision, parallel with, and 2 inches behind, the costal margin of the right side, is made through the skin, panniculus, external oblique m., transverse abdominal m. and peritoneum. The omentum, usually containing masses of fat, occupies the incision and by gentle traction on this the pyloric region of the abomasum can be exposed. This portion of the abomasum is carefully lifted out of the incision followed by as much as possible of the main body of the abomasum. The extent to which this can be done varies in different animals and is facilitated by cutting the thin muscular slips between the omasum and abomasum. After packing off the abomasum two small incisions some distance apart along the line of the greater curvature are made in the greater omentum and one arm of a large bowel clamp is introduced through one incision, passed along the inner aspect of the abomasum and out again through the other incision. The clamp is tightened and the inferior omaso-abomasal artery lying in the omental fat ligated. An incision approximately 4 inches long (Text-Fig. 1, Figs. 1 and 2) is made through both walls of the abomasum and the ingesta removed. Bleeding is rather troublesome at this stage and it is advisable to place additional clamps on the abomasal arteries. The flap of abomasum is then everted (Fig. 3) and the mucous membrane cut through from side to side and resected on either side of the incision for about $\frac{3}{4}$ inch (Fig. 4). This procedure is rather difficult because of the large folds of mucous membrane which are present in the body of the abomasum. A large isthmus is thus prepared and the upper flap of mucosa sutured to the mucosal edge of the main stomach using an infolding thread suture, so closing the main body of the stomach (Text-Fig. 1, Fig. 5). The muscle coats of the isthmus, exposed when the mucosa is resected, are sutured to the cut edge of the wall of the stomach, covering and strengthening the mucosal junction. The small dependent portion of abomasum is everted and gradually closed with an infolding suture to form the pouch (Text-Fig. 1, Fig. 6). The cannula can be placed in position before the pouch is completely closed or a small stab incision may be made in the pouch after closing and the cannula placed in here. After passing stay sutures (nylon) from the cannula through the body wall the end of the cannula is brought out through the lower end of the initial incision and anchored with nylon sutures. The peritoneum and muscle layers are closed with continuous nylon sutures and the skin with a continuous Halstead suture.

(*b*) *Modified Pavlov Pouch*

This method was first described by Boldyreff (1925) and later independently by Neuwelt, Olson and Necheles (1940). These workers were concerned about the small vagal supply received by the orthodox Pavlov pouch unless a large isthmus is made and evolved this method, where the posterior wall of the pouch has a complete vagal supply.

The procedure is similar to that of the orthodox Pavlov pouch but the initial incision of the abomasum is made across the anterior surface and the posterior surface left intact. A flap of abomasum is thus formed which is turned down and the mucosa incised as in the orthodox Pavlov pouch. The upper portion of resected mucosa is sutured to the mucosa of the main abomasum and the stomach so closed. The mucosa of the small flap is sutured with an inturning suture, followed by the muscle coats, forming the pouch. A cannula may be inserted in the pouch before closure is complete or through a separate stab incision.

(*c*) *A Method of Transection and Anastomosis*

The abomasum is exposed as in the previous methods and two small apertures, about 3 inches apart, are made in the lesser omentum, dorsal to the abomasum, and another pair in the greater omentum, ventral to the abomasum. Two large bowel clamps are placed across the abomasum through these apertures and the superior and inferior omaso-abomasal arteries

TEXT-FIG. 1.

PREPARATION OF PAVLOV POUCH. (a)

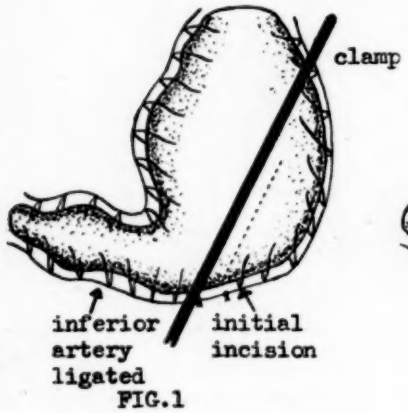
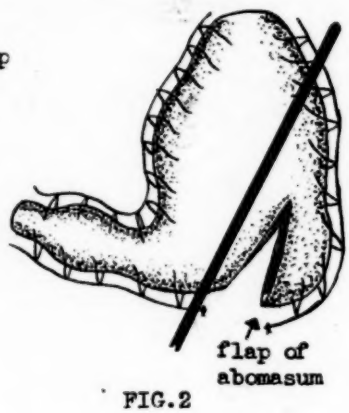


FIG.1



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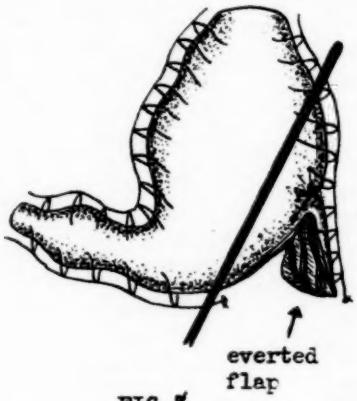

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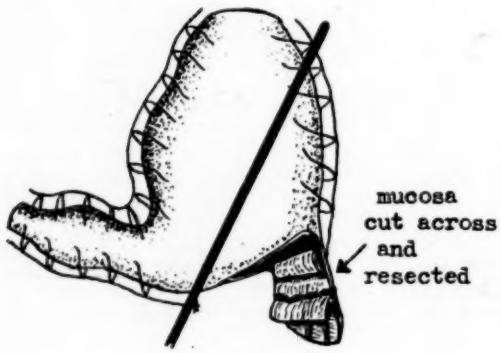

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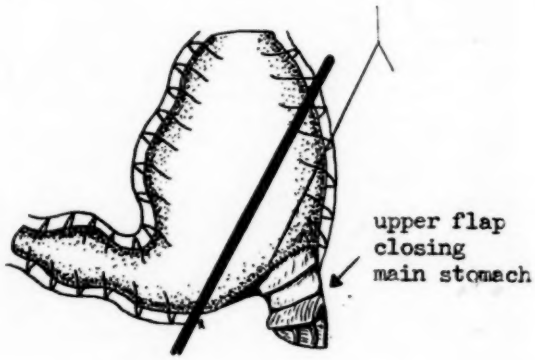

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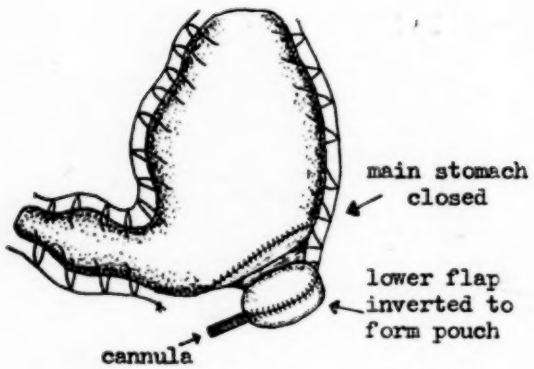

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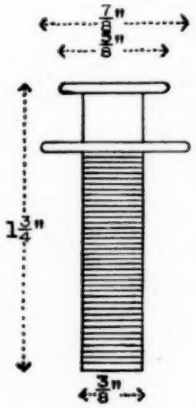
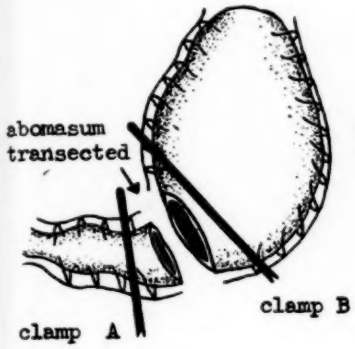


SILVER CANNULA
FIG.7

Text-Fig. 2.

PREPARATION OF INNERVATED POUCH (c)



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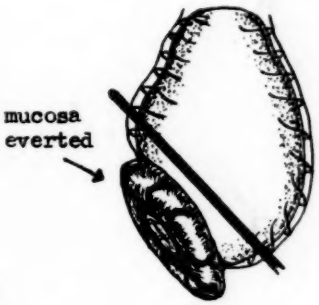

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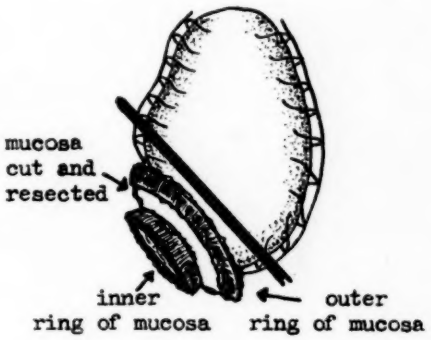

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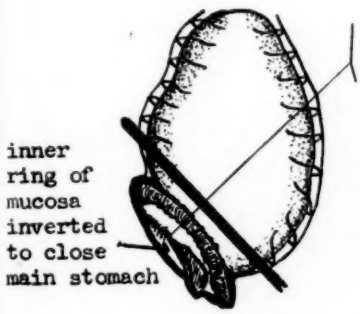

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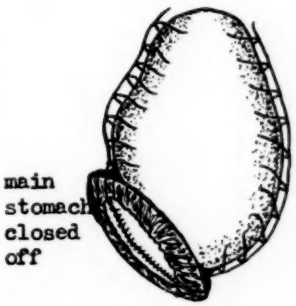

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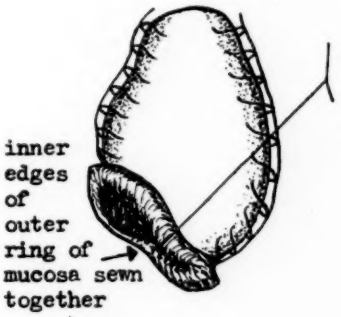

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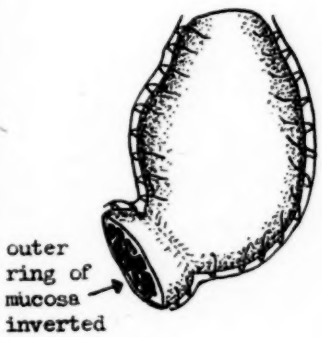


FIG.7

FIG.8

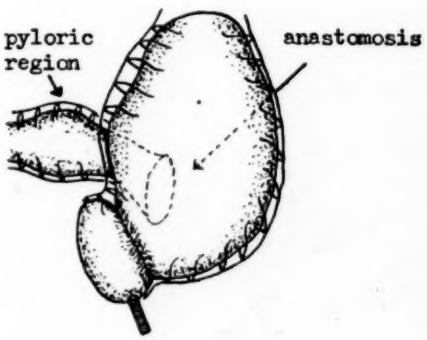
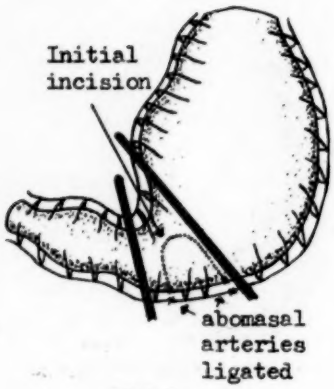


FIG.9

TEXT-FIG. 3.

PREPARATION OF HEIDENHAIN TYPE POUCH (a)



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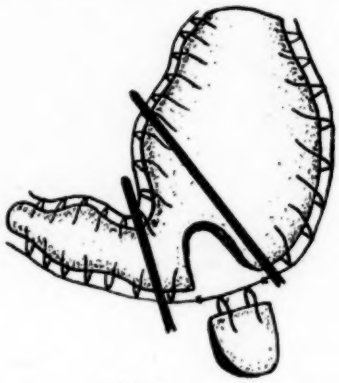

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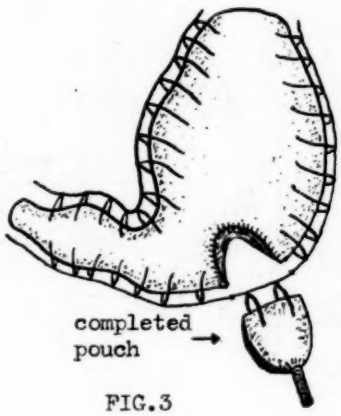
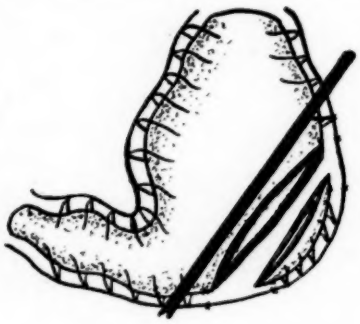


FIG.3

PREPARATION OF HEIDENHAIN TYPE POUCH (b)

FIG.1



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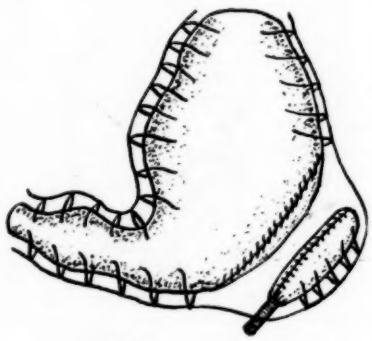

FIG.3

PREPARATION OF HEIDENHAIN TYPE POUCH (c)

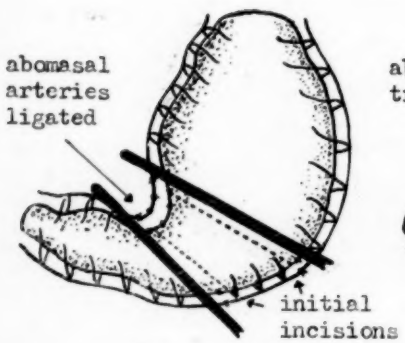

FIG.1

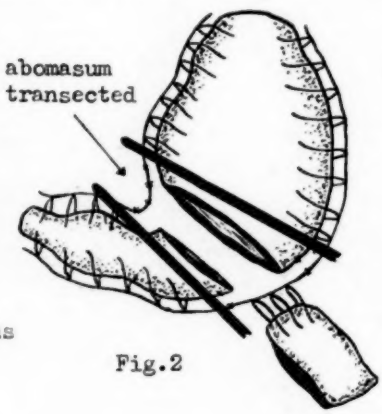

Fig.2

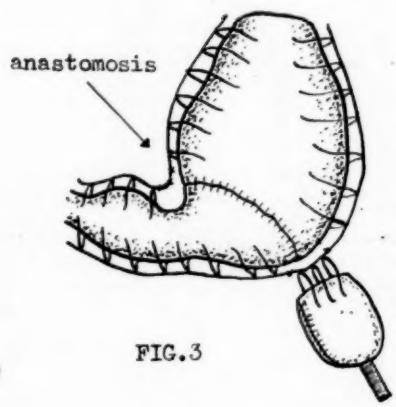

FIG.3

ligated and, along with the abomasum, are completely transected between the clamps (Text-Fig. 2, Fig. 1). At this stage the pyloric end of the abomasum is wrapped in damp sterile gauze and partially returned to the abdominal cavity.

Clamp B is gently released and the abomasal contents allowed to escape into a suitable receptacle. After swabbing out the interior of the abomasum the clamp is moved cranially about 3 inches and the tube of abomasum everted (Text-Fig. 2, Fig. 2). A circular incision is made through the mucous membrane which is then resected about $\frac{3}{4}$ inch from the incision in both directions (Text-Fig. 2, Fig. 3). Using an inturning suture (thread) the edges of the inner ring of mucosa are sutured together and the main stomach closed off (Text-Fig. 2, Figs. 4 and 5), the partition being strengthened by suturing the exposed muscle coats together. Following this procedure the inner edges of the outer ring of mucosa are brought together in a similar fashion (Text-Fig. 2, Fig. 6) so forming one side of the pouch. The pouch is completely closed by suturing the mucosa and muscle layers of the edge of the flap together with an infolding suture (Text-Fig. 2, Figs. 7 and 8). A suitable cannula may be introduced into the pouch before it is completely closed or a separate incision may be made through the wall of the pouch and the cannula sutured in position (nylon) through here.

Following completion of the pouch the pyloric region is exposed again and anastomosed to the main body of the abomasum on its posterior surface (Text-Fig. 2, Fig. 9). The clamps are removed and the abomasum and pouch replaced in the abdominal cavity. Omentum is wrapped around the pouch and the anastomosis and the cannula brought out through the lower end of the incision. Nylon anchoring sutures are placed through the cannula and body wall. The incision is closed with continuous nylon sutures through the peritoneum and transverse abdominis, and through the remaining muscle coats and with interrupted Halstead sutures through the skin.

2. Denervated Pouches

Heidenhain Type Pouch (a)

This pouch to all intents and purposes is the same as that originally described by Heidenhain (1879). The abomasum is exposed as for the Pavlov pouch. Two of the abomasal branches of the inferior omaso-abomasal artery, about 3 inches apart, are ligated and cut and two large clamps placed across the abomasum through small apertures in the omentum (Text-Fig. 3, Fig. 1). A semi-circular portion of the abomasum is cut out, care being taken not to go too close to the lesser curvature and to leave the inferior omaso-abomasal artery intact (Text-Fig. 3, Fig. 2). The cut edges of the mucosa of the main stomach are closed with an inturning suture (thread) followed by similar treatment of the muscle coats. The edges of the pouch of material cut out from the abomasum are turned in and sutured in a similar fashion and a cannula placed in position as usual (Text-Fig. 3, Fig. 3). The abdominal wound is closed as before.

Heidenhain Type Pouch (b)

Instead of the semi-circular portion of abomasum cut out in the previous method, a shallow cap is cut off the greater curvature, the inferior omaso-abomasal artery being left intact (Text-Fig. 3, Figs. 1 and 2). The abomasum and pouch are closed in the usual way (Text-Fig. 3, Fig. 3).

Heidenhain Type Pouch (c)

The abomasum is exposed and two large clamps placed across the body region just anterior to the commencement of the pyloric region. The abomasal branches from the portion of the superior omaso-abomasal artery lying between the clamps are ligated and cut and also two of the branches from the inferior omaso-abomasal artery, approximately 2 inches apart (Text Fig. 3, Fig. 1). Complete transection of the abomasum is carried out in two places, about 2 inches apart, and the small flap of abomasum turned down (Text-Fig. 3, Fig. 2). This flap is wrapped in sterile gauze whilst the two cut ends of the abomasum are anastomosed. It may be found necessary to move the clamps a little farther away from the cut edge to allow an adequate amount of tissue for suturing. After the anastomosis is complete the large bowel clamps are removed, the inferior omaso-abomasal artery being clamped on either side of the future pouch by small haemostats. The edges of the small flap of abomasum are closed with an inturning suture and a suitable cannula placed in position either before the pouch is completely closed or through a separate incision.

Difficulties Encountered in Preparing Pouches

A number of difficulties peculiar to the ruminant have been encountered during the preparation of abomasal pouches and it may be of value if some of these are mentioned briefly.

Commonly, during the operation, the rumen becomes distended with gas and to facilitate matters it is useful to puncture the rumen and allow the gas to escape, the aperture being closed with a single suture afterwards. During this procedure the rumen must be well packed off and, similarly, adequate packing off of the abomasum must be carried out to prevent gross infection of the operation site when its contents are removed.

Occasionally, difficulty is encountered with the small abomasal branches of the inferior and superior omaso-abomasal arteries. These are often very delicate and tend to tear easily when being separated from the omental fat. Numerous large folds are found in the mucosa of the body region and these often render resection of the mucosa a difficult and tedious business. In addition, they tend to fill the lumen of the completed pouch and prevent adequate drainage. Another difficulty associated with the resection of the mucosa is the provision of satisfactory haemostasis. On occasion it has been found necessary to supplement the large clamps across the abomasum and to place small haemostats on the omaso-abomasal arteries.

Some form of dressing held in position by a canvas body belt is useful in keeping the wound free from faecal material, urine, etc. Digestion of the abdominal wall with gastric juice occasionally occurs, usually because of some leakage round the outside of the cannula. This is a most difficult and refractory condition to deal with and invariably the animals have ultimately to be destroyed.

Cannulae.—A number of different types of cannulae have been used during experimental work on goat pouches. Stainless steel, perspex, rubber and silver have all been used for preparing cannulae and although there is no great difference in the reaction of goat tissues to these substances, silver appeared to cause a minimum of irritation. The most suitable cannula has been found to be a silver one of $1\frac{3}{4}$ inches length and $\frac{3}{8}$ inch internal diameter. A small flange is fitted at the end which is placed in the pouch and $\frac{1}{2}$ inch along from here is a small ring fitted with two apertures for the attachment of the cannula in the pouch. A screw thread is provided along most of the length of the cannula so that additional rings may be added to hold it in position against the abdominal wall (Text-Fig. 1, Fig. 7).

Experimental Results

An indication of the behaviour of the pouches which have been used most frequently is provided by the following figures, extracted from the protocols of actual experiments.

Goat 8. Innervated Pouch. Method *b* (Modified Pavlov)

Period fasted. Hours	Volume ml.	Free acid grammes % HCl	Total acid grammes % HCl
2	11·2	0·165	0·208
3	10·0	0·159	0·192
4	8·8	0·113	0·158
24¼	5·2	0·093	0·122
25¼	6·0	0·114	0·129
Fed cattle cake and hay			
1	5·8	0·091	0·122
2	7·0	0·120	0·163
3	7·2	0·115	0·165
4	7·8	0·170	0·256
5	9·6	0·237	0·271

Goat 19. Innervated Pouch. Method *c* (Transection and anastomosis)

Period fasted. Hour	Mins.	Volume ml.	Free acid grammes % HCl	Total acid grammes % HCl
	20	19·4	0·296	0·320
	40	20·2	0·285	0·309
	60	21·0	0·287	0·303
1	20	22·0	0·281	0·301
1	40	19·2	0·287	0·307
2		21·4	0·298	0·318
2	20	22·4	0·292	0·309
2	40	23·6	0·266	0·290

Goat 17. Denervated Pouch. Method *a*

Period fasted. Hours	Volume ml.	Free acid grammes % HCl	Total acid grammes % HCl
23¾	7·2	0·141	0·183
24¼	2·2	0·106	0·149
25¼	4·8	0·112	0·149
26¼	2·6	0·099	0·164
27¼	3·0	0·102	0·161
28¼	3·4	0·120	0·161
29¼	4·8	0·120	0·170
Fed cattle cake and hay			
1	3·4	0·183	0·223
2	8·4	0·214	0·258
3	6·2	0·247	0·258
4	8·6	0·288	0·303
5	6·4	0·285	0·327
6	10·0	0·277	0·348
7	9·4	0·276	0·323

Summary

Six different techniques for preparing innervated and denervated abomasal pouches in the goat are described.

Details of anaesthesia, post-operative care, type of cannula used and the difficulties encountered in the preparation of abomasal pouches are also provided.

Acknowledgments.—The expenses of this investigation were partly defrayed by a grant from the Agricultural Research Council. The remainder were met by a grant from the Animal Health Trust during the tenure of a Research Training Scholarship by K. J. H.

(*Concluded at foot of next column*)

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CLINICAL COMMUNICATIONS

ENZOOTIC PNEUMONIA IN CALVES

I. The Natural Disease

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and
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Introduction

It is well known that diseases take a heavy toll of the calf population throughout the world. Lovell and Hill (1940) showed that in 355 herds in England and Wales, 12,544 female calves were born over a period of two years and of these 5·5 per cent. died before the age of six months. Lovell (1945) also estimated that in the county of Cumberland 3,500 calves were lost each year. In America Udall (1946) quoted figures to show that a loss of 13 per cent. of female calves occurred between birth and one year. This 13 per cent. loss was said " to be the normal average —the rate in affected herds must be still higher." In New Zealand Ward (1946) found that 4·3 per cent. of calves were born dead or died at birth, and a further 3·2 per cent. failed to survive to 12 months of age. About 40 per cent. of the deaths amongst calves born alive occurred in the first seven days. In New Zealand about 2 per cent. of all deaths were attributed to " chills, pneumonia, etc." Sutherland (1950) stated that " in Queensland, pneumonia is considered one of the important causes of loss, although we have no figures to substantiate this."

It is generally agreed that the losses which occur in the first six months of life are attributable very largely to either a form of diarrhoea, pneumonia, or both. Although it has been a convenient practice to separate these two major diseases, the two conditions are not infrequently seen together as one complex disease entity. Udall (1946) stated that " typical pneumonia epidemics may be ushered in with or without diarrhoea, in pneumonia there may also be a terminal diarrhoea." He was also of the opinion that pneumonia produced a higher mortality than scours. The close association between scours and pneumonia has resulted in the use of the term " pneumo-enteritis " by some American workers.

The purpose of the present communication is to draw attention to the clinical aspects of a form of calf pneumonia seen in Cheshire, Lancashire and Cumberland.

Features of Calf Pneumonia

Age Incidence.—There is an impression, somewhat widely held, that pneumonia is a disease of older calves. In our experience this view requires some modification.

As early as 1921 Carpenter and Gilman described an acute form of pneumonia in which the calves were dead or diseased at birth. Sholl (1935) also drew attention to a form of foetal pneumonia in calves. We have seen calves affected at birth and calves which have died from an acute pneumonia in the first seven days of life. In two large herds where records are kept, the ages at which deaths occurred from pneumonia may be seen in Table I.

TABLE I

Farm A		Farm B	
Age in days at which death occurred	Number of deaths	Age in days at which death occurred	Number of deaths
1– 7	6	1– 7	2
7–15	3	7–15	3
15–22	0	15–22	0
22–29	0	22–29	0
29–36	2	29–36	2
36–58	3	36–58	5

Seasonal Incidence.—Most of the cases of calf pneumonia occur in the late winter and early spring, but they may arise at other times. One outbreak, seen in Cheshire in September, 1949, involved calves between three to five months of age. The morbidity rate was 66 per cent. and the mortality 50 per cent. The monthly mortality on one farm in Cumberland may be seen in Table II.

TABLE II

Farm A		
Month	Number of calvings	Number of deaths
November ...	3	1
December ...	1	0
January	3	3
February ...	2	1
March	9	3
April	8	5
May	1	1

Predisposing Factors.—As with other respiratory diseases the initiation and the degree of severity of outbreaks of calf pneumonia may be closely related to adverse nutritional and environmental factors. Chilling, poor ventilation, overcrowding, insanitary housing, etc., have long been recognised as important predisposing causes and all are thought to play a part in the spread of the disease. In many of the outbreaks seen in Cumberland the accommodation for the calves was very inadequate with insufficient lighting, overcrowding and faulty ventilation. On the other hand, outbreaks in the same district have occurred where calves were kept in individual pens, although here again the ventilation was thought to be somewhat inadequate and the husbandry not as good as it might have been.

It is well known that the feeding of colostrum plays an important part in getting a calf "off to a good start." Almost without exception the calves reared in Cumberland in the herds under observation were given colostrum at birth and for the first four days. This practice did not appear to prevent the appearance of calf pnuemonia, although it may well be, of course, that if colostrum had not been given, then the morbidity and the mortality might have been much higher.

Aetiology.—A variety of micro-organisms have been recovered from the lungs of calves affected with pneumonia and many attempts have been made by other workers to set up the disease experimentally by the inoculation of cultures. Most workers are agreed, however, that no clear-cut evidence has been obtained which incriminates any bacterium as the primary aetiological agent. The literature on this subject has been briefly reviewed elsewhere (Jennings & Glover, 1952), together with an account of an investigation into the probable causation of the outbreaks of pneumonia described in this paper. It will be shown that a low-grade pneumonia could be reproduced in calves and transmitted in series by the inoculation of filtered and unfiltered material, but all attempts to establish the agent in small laboratory animals were unsuccessful.

Symptoms.—The disease may appear in an acute, subacute or chronic form. The acute type is seen mostly in calves a few hours to two days old, and in some instances is characterised by sudden death. In the subacute form the principal symptoms are those of dullness, inappetence, listlessness, increased respirations and rapid pulse rate: these symptoms may not be very noticeable in the early stages. The temperature may be normal or only slightly raised unless suppuration is present in the lungs. Most cases present this subacute form of the disease and it is usually followed by a rapid deterioration in the general condition of the calf, characterised by drooping of the ears, scouring, and laboured breathing. Coughing usually develops and a characteristic muco-purulent nasal discharge is seen almost invariably. In some outbreaks a short dry cough may be the only symptom in the early stages and this may not be apparent unless the calves are disturbed and moved about.

The course of the disease varies a good deal. Some calves may show evidence of recovery after five or six days, whereas others may be ill for long periods. Coughing and a nasal discharge often persist for several weeks. An animal may have several relapses with intermittent periods of apparent recovery before it ultimately dies. Cases which have recovered are often stunted and may be easily picked out in a group of animals.

Post-mortem Findings.—The carcase is generally in poor condition and dehydrated. There may be a slight catarrhal enteritis and the adjacent lymph nodes are often enlarged and moist. The parenchymatous organs usually show degenerative changes. A constant feature in field and experimental cases is the presence of an acute turbinitis and inflammation of the nasal chambers. The lungs show various degrees of inflammatory changes ranging from an acute congestion to a frank suppurative broncho-pneumonia. Pleurisy may be present. Acute cases may show lesions of a septicaemia.

Bacteriological findings have been fairly constant in all cases. Many of the pneumonic lungs were sterile on culture, except in cases where there was suppuration and in these calves *C. pyogenes* was usually isolated. Non-haemolytic *Bact. coli* was isolated fairly frequently from the mesenteric lymph nodes in a proportion of the cases which showed enteritis. Haemolytic coliform organisms were occasionally isolated from scour cases and sometimes from those which showed no gross changes in the alimentary canal.

Treatment.—A very wide range of therapeutic agents has been tried, including the usual "scour mixtures," sulphapyridine, sulphamezathine, penicillin and the triple sulphonamides. Prophylactic measures which have been instituted include the administration of cod-liver oil to the

pregnant cows, the feeding of colostrum, and injections of concentrated vitamin A for the new-born calf. In some cases a mixed pneumonia vaccine has been tried. Serum from recovered cases has also been used for treatment and prophylaxis. In view of the possibility of pre-natal infection it was thought that the dam's serum might contain antibodies against the causal agent. In a number of herds, therefore, either dam's serum or whole blood was given parenterally to the new-born calves. The results of the various forms of treatment used are difficult to assess and the authors feel that a satisfactory therapeutic or prophylactic agent has yet to be identified, although the use of immune serum appears to have some value.

Discussion

The frequency with which we have encountered respiratory disease in calves of all ages and especially in young calves (one to 15 days old) has prompted us to write this short note. In the past losses in calves of this age have usually been attributed to " white scours " and, although not wishing to under-emphasise the importance of this disease, we feel that perhaps insufficient attention has been given to the significance of a primary respiratory involvement. It is, perhaps, a mistake to assume that a condition in young calves in which diarrhoea is the main feature is necessarily a disease of the alimentary tract alone.

We have been impressed by the high incidence of the disease in early life and the observation that new-born calves may be affected. The recognition of lesions in the very young calf is an indication of pre-natal infection and falls in line with observations of a similar nature by other workers. Calves appear to be most susceptible in the first fortnight after birth and again at about one month of age.

The pattern of the various outbreaks has followed the same general lines, but there have been variations in the clinical details. The outbreaks in Cumberland and Lancashire have been mainly confined to younger calves, whereas one outbreak in Cheshire involved calves of three to five months of age. In some of the cases in young calves, scouring has been the main clinical feature and has been followed by pneumonia, whereas in other outbreaks the disease has commenced as a pneumonia. In the older age group diarrhoea was not a common symptom.

The clinical history, the *post-mortem* and bacteriological findings of these outbreaks of calf pneumonia are all so very similar that it is not improbable that a primary single causal agent may be involved.

Summary

Attention is drawn to a form of enzootic calf pneumonia seen in North-West England. The disease may be more common than is realised and outbreaks may be wrongly diagnosed as " white scours."

Acknowledgments.—We wish to acknowledge the helpful co-operation at all times of the following practitioners: Messrs. Forteath, Watson, Mowat, Sumner and Highet, M.SR.C.V.S.

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AN ATTEMPT TO TRANSMIT RINDERPEST TO CHINESE PIGS

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As opinions seem to differ on the susceptibility of Chinese pigs to rinderpest the opportunity was taken here during cattle challenge tests to attempt the infection of pigs with wild rinderpest virus.

The animals chosen were two Chinese locally bred pigs about three months old, and weighing approximately 40 lb., in good and apparently healthy condition. The material injected was obtained by maceration with normal saline of 5 grammes of spleen removed from a calf dead of rinderpest; 5 c.c. of macerated spleen was injected into each pig.

The virus was the second passage of wild virus originally obtained from Bangkok and the dead calf was the control used in a second cattle experiment.

A natural case of rinderpest has not occurred in Hong Kong during the past two years and so far as the writer is aware, no case of rinderpest has been observed in either imported or locally bred pigs.

Date	Temperature		Remarks
	Pig No. 1	Pig No. 2	
10.5.51	103·2	103·0	5 c.c. virus injected s/c 5.13 p.m.
11.5.51			
a.m.	102·8	102·6	No abnormality detected.
p.m.	103·0	103·6	
12.5.51			
a.m.	103·6	103·0	Both animals slightly off feed in the
p.m.	102·4	102·8	evening.
13.5.51			
a.m.	104·8	103·6	No. 1 coughing.
p.m.	105·6	104·0	Both refused food.
14.5.51			
a.m.	105·0	104·2	Water and small amount of grass taken,
p.m.	105·2	105·2	otherwise off feed.
15.5.51			
a.m.	105·2	106·4	Accelerated respiration and some dys-
p.m.	104·2	106·0	pnoea observed in No. 2.
16.5.51			
a.m.	103·4	104·4	Appetite slightly improved. Respira-
p.m.	104·6	105·0	tory symptoms subsided.
17.5.51			
a.m.	103·4	103·6	Appetite continued to improve.
p.m.	104·2	103·4	
18.5.51			
a.m.	103·0	102·5	Both animals appeared normal.
p.m.	101·4	102·0	

Summary

A small-scale experiment was conducted to observe the results of rinderpest spleen virus injection on native Chinese pigs. Thermal reaction is recorded on the third day, increasing to the fifth day, then subsiding and becoming normal on the eighth day. Slight respiratory symptoms were noted but no other manifestations of rinderpest were observed.

ABSTRACT

Studies on the Alimentary Tract of the Merino Sheep in South Africa*

XVIII.—Sheep with rumen fistulae maintained on either grass or lucerne hay were used to study the influence of fasting on the ability of the rumen contents to ferment cellulose. Rumen liquor was withdrawn and tested *in vitro* for periods of 24 hours or more, by inserting cotton threads and finding the time required for the threads to snap when tested manually for their tensile strength. Fasting always reduced the ability of the liquor, tested in this way, to ferment cellulose and the depression reached its lowest point after 48 hours' fasting. On the resumption of feeding the speed with which cellulose fermentation returned to normal was related to the speed at which sheep came back to their full feed; with grass hay this was rapid, with lucerne hay, gradual. Sheep used to consuming casein only gradually became accustomed to casein again after a period of fast. These experiments are used as the basis of a recommendation that care should be taken in the food given to ruminants after a fast, for until full activity of the flora has been resumed digestion cannot be normal. Care with protein-rich foods is especially recommended.

XIX.—The addition of sulphanilamide to rumen liquor decreases the rate of fermentation of glucose as judged by the gas formed *in vitro*. It depresses cellulose fermentation similarly, as judged by the cotton thread test. Five g. sulphanilamide given twice daily depressed food consumption considerably but 24 hours after dosage ceased, food consumption increased again. In spite of these findings sulphanilamide never attained therapeutic concentrations in the blood. Comparison of the concentration in peripheral blood of normal and atropinised sheep suggested that absorption was slower after atropinisation which immobilises the rumen and reticulum and so may be expected to inhibit the onward passage of food from these organs. This suggested that parental administration of sulphanilamide should be made whenever possible.

XXI.—Large doses of urea or casein may cause sudden death when given to sheep maintained on a poor ration. Both are known to be rapidly deaminised in the rumen so that studies on the toxicity of urea may have a bearing on the possible outcome of feeding high protein rations.

Experimental urea poisoning appeared 30 to 60 minutes after administration and was characterised by dullness, hyperaesthesia, muscular twitchings leading to severe spasms and varying degrees of "bloating." The syndrome is said to resemble strychnine poisoning. *Post-mortem* examination revealed gross venous congestion, and sometimes hydrothorax with pulmonary oedema and epi- and endocardial haemorrhages. Fatty degeneration was observed in the liver and kidney tubules.

Sub-lethal doses, 10-15 g., caused cessation of rumen movements in grass hay fed sheep; 20 g. was required for lucerne hay fed sheep. Movements returned within three to four hours but occasionally were inhibited for 48 hours. Twenty g. urea given intravenously caused no apparent ill effect while 7 ml. ammon. fort. diluted with 700 ml. saline given intravenously in three doses during two hours caused dyspnoea and, after the final injection, coma from which recovery occurred in one hour. The administration of 40 ml. acetic acid (presumably glacial) suitably diluted together with 24 g. of urea—a lethal dose to grass hay fed sheep—prevented any signs of urea poisoning appearing. It was argued that rapid fermentation of sugar (form not stated) resulting in organic acid formation should also protect against urea poisoning; an experiment to test this hypothesis produced no evidence to support this contention. Sheep which were accustomed to consuming 15 g. casein daily, however, showed a high degree of resistance to otherwise lethal doses of urea. The evidence presented suggests that urea poisoning is more complicated than was at first supposed.

XXII.—The rumen liquor is less well buffered in the alkaline ranges than in the acid ranges. Following investigations on the toxicity of urea, the effect of alkalinity of the rumen contents on motility was examined and it was found that as the *p*H increased from 7·5 by the addition of sodium hydroxide or carbonate, the strength of contractions diminished and finally ceased altogether.

In a few instances when sheep with an alkaline rumen were induced to feed, contractions returned to normal immediately but became quiescent again as soon as feeding ceased. The injection of carbamyl-choline also induced a normal response. The intravenous injection of alkali, however, caused immediate cessation of movement although control injections of saline did not. There was a lag after administering alkali into the rumen and cessation of motility, while on occasion the *p*H returned to the region of seven before normal motility was resumed. These facts suggest that cessation of motility is due to central effects rather than to a peripheral one due to the presence of alkali in the rumen. Treatment with acid was effective only after a delay. The theoretical implications of these results are barely discussed as attention is focused on possible practical applications. It was found that repeated doses of sulphanilamide produce ruminal stasis and that after four days' treatment the *p*H of the liquor was 7·8. Treatment with acetic acid was followed by recovery. There is practically no information on the *p*H of the rumen in clinical cases of ruminal atony.

A. T. P.

* **Studies on the Alimentary Tract of the Merino Sheep in South Africa. XVIII.—The Effect of Fasting on the Activity of the Ruminal Flora of Sheep and Cattle.** Quin, J. I., Oyaert, W., & Clark, R.; **XIX.—The Influence of Sulphanilamide on the Activity of the Ruminal Flora of Sheep and Cattle.** Oyaert, W., Quin, J. I., & Clark, R.; **XXI.—The Toxicity of Urea to Sheep under Different Conditions.** Clark, R., Oyaert, W., & Quin, J. I.; **XXII.—The Effect of the *p*H of the Ruminal Contents on Ruminal Motility.** Clark, R., & Lombard, W. A. (1951.) *Onderstepoort J. vet. Res.* **25**: 51, 59, 73 and 79.

"ESSENTIAL" HORSES TO GET MORE RATIONS

The Ministry of Food has announced that ration cards and coupons entitling owners of essential transport horses to draw feeding-stuffs will be issued shortly for the winter rationing period which begins on November 1st.

Rationed feeding-stuffs will be allowed for horses engaged in essential transport, and for riding or driving horses which are used by doctors and veterinary surgeons for professional purposes, or which are used as an essential means of transport for other professional or business purpose. They will not be allowed for horses used for domestic riding or driving purposes, except in special circumstances.

* * * * *

A strain of homing budgerigars which will fly free during the daytime and return to their enclosures has been established by the Duke of Bedford at Woburn, Bedfordshire.

REVIEW

[Breeding for Production. By Brian Branston, M.A. Faber: 12s. 6d.]

In writing this book the author was making "an attempt to classify for the benefit of farmers with mud on their boots and corns on their hands the present *useful* knowledge of the most important rules according to which animals breed."

He has succeeded admirably. We know of no work which presents the basic elements of genetics and their application to animal breeding in a more readily understandable form.

This is the book to recommend or lend to the livestock owner with little scientific knowledge, who has awakened to the fact that appearance cannot be relied upon in selecting dairy cows, for instance, and wants to know the why and wherefore of grading up, progeny testing, etc. We have no doubt, too, that many busy veterinary surgeons—with mud on their boots, etc.—themselves will find much of interest and value within its covers.

The cost is rather high for a book of its size, but this probably results from the large number of excellent diagrams which it contains.

NOTES AND NEWS

Diary of Events

Oct. 13th.—Special General Meeting of the Society of Women Veterinary Surgeons, at Liverpool (Veterinary Hospital, Pembroke Gardens), 2.15 p.m.: General Meeting of the Society, 2.30 p.m.

Oct. 17th.—Meeting of the Lancashire Division, N.V.M.A., at Liverpool (Veterinary Hospital, Pembroke Gardens), 2.30 p.m.

Oct. 18th.—Meeting of the Western Counties Division, N.V.M.A., at Exeter (Imperial Hotel), 2 p.m.

Oct. 18th.—Meeting of the Herts and Beds Division, N.V.M.A., at 70, Holywell Hill, St. Albans, 2.30 p.m.

Oct. 19th.—Meeting of the Mid-West Division, N.V.M.A., at Bristol (School of Veterinary Science, University of Bristol), 2 p.m.

Oct. 19th.—Meeting of the Biochemical Society at London Hospital Medical College, E.1, 2 p.m.

Oct. 25th.—Meeting of the South-East Midlands Division, N.V.M.A., at Northampton (Franklin's Gardens Hotel, Weedon Road), 2.30 p.m.

N.V.M.A. Committees and Council

The following dates have been arranged for the next meetings of Committees and Council, to be held in London, the Committees at 36, Gordon Square:—

Wednesday, November 7th
2.0 p.m. Veterinary State Medicine Committee.
4.0 p.m. Parliamentary and Public Relations Committee.

Thursday, November 8th
10.0 a.m. Organising Committee.
12.0 noon. Home Appointments Committee.
2.15 p.m. General Purposes and Finance Committee.

Friday, November 9th
11.0 a.m. Council Meeting.

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Rendering of Detailed Accounts

On a number of occasions, the Association has been requested to give its views on the desirability of veterinary surgeons rendering accounts in detail to their clients. The Association considers that this should remain a private matter between veterinary surgeon and client.

PERSONAL

Births.—Bowditch.—On September 24th, 1951, at Windsor, to Sheila (*née* Scott), M.R.C.V.S., wife of Edmund Bowditch, M.R.C.V.S., a son.

Collyns.—On October 7th, 1951, at Gloucester City Hospital, to Addison (*née* Neale), wife of David J. Collyns, a son.

Oates.—On Thursday, October 4th, 1951, at St. Mary's Hospital, Paddington, to Mary, wife of W. G. R. Oates, Secretary and Registrar of the Royal College of Veterinary Surgeons, a son—John Geoffrey.

Robertson.—On September 30th, 1951, at Hong Kong to Decima, wife of Lieut.-Colonel R. H. Robertson, O.B.E., M.R.C.V.S., a daughter.

Smith.—On September 16th, 1951, at British Military Hospital, Hannover, to Elizabeth, wife of Captain F. Roy Smith, R.A.V.C., a daughter—Denise Jane Elizabeth.

Wickens.—On September 29th, 1951, to Mary (*née* Wheat) and John Wickens, M.R.C.V.S., of Cage Farm Lodge, Tonbridge, a brother, David, for Rosemary.

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Marriages.—Griffiths—Williams.—On September 14th, 1951, at St. Luke's, Llanllwch, Caermarthen, Alan Vaughan Griffiths, M.R.C.V.S., son of Dr. and Mrs. J. Griffiths, Brynawel, Llandyssul, to Mary Jane Fanod Williams, eldest daughter of Mr. and Mrs. J. Williams, Blaensarre, Rhydlewis, Llandyssul.

Miller—Greig.—On October 6th, 1951, at St. John's Church, Mexborough, Yorks, Alexander M. H. Miller, B.Sc., to Jean Greig, M.R.C.V.S.

Self—Williams.—On September 15th, 1951, at St. Michael's Church, Braintree, Essex, Anthony Self, M.R.C.V.S., to Audrey, daughter of Mr. and Mrs. W. Williams, of Rayne, Essex.

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THE NORDIC VETERINARY SOCIETY FOR SEXUAL PHYSIOLOGY AND PATHOLOGY

FIRST CONGRESS, STOCKHOLM, 1951

In April, 1951, representatives from Denmark, Finland, Norway and Sweden met to initiate a Nordic veterinary society for sexual physiology and pathology, with the aim of promoting among the Nordic countries co-operation in research and the exchange of knowledge in this scientific field.

Since the Danish veterinarians Albrechtsen and Poulson 50 years ago began to specialise in the problems of reproduction the Scandinavian countries have been progressive both in the practice and scientific study of this aspect of veterinary work.

About 250 of the 500 members were present at the first Congress of the Society in August, 1951, when 25 papers were presented. Further information about the Society or the papers presented at the Congress may be obtained from the Secretary, Dr. E. Blom, State Veterinary Serum Laboratory, Copenhagen, Denmark. The President is Professor Nils Lagerlöf, Royal Veterinary College, Stockholm, Sweden. The next congress will be held in Oslo during the summer 1952.

The first eleven papers dealt with observations from A.I. work.

1. N. O. Rasbech (Denmark). Study of the fertility of A.I. bulls with and without the addition of streptomycin to the semen diluter.

In about 4,000 first inseminations from 44 bulls in which each ejaculate was split into two halves and one half was diluted with streptomycin treated diluter (0·5 g. dihydrostreptomycin/litre diluter) the treated semen gave 4·6 per cent. better conception rate (C.R.).

2. H. C Adler (Denmark). Observations on the use of the percentage of non-returns as a measure of an A.I. bull's fertility.

From 9,127 first inseminations non-returns at 30 to 60 days were 15·3 per cent. higher and non-returns at 60 to 90 days were 5·5 per cent. higher than pregnancy results obtained by rectal palpation (C.R. 52·9 per cent.). In Denmark there is no Sunday insemination so that cows inseminated on Monday may have been in heat since Saturday. On Mondays 1 458 inseminations from two bulls gave a C.R. of 51 per cent. and 1,240 inseminations from the same bulls on other days of the week had a C.R. of 54 per cent.

3. J. Hemnell (Finland). Report on A.I. activity in Finland.

A.I. began in 1947 in Finland and now involves 52,000 cows which have required 1·6 services per conception in 1950. The bulls which were quietest to work with gave more trouble due to unwillingness to serve than those which were less docile.

4. Th. Swensson (Sweden). The conception rate after varying intervals between calving and first insemination in the Swedish Red and White Breed.

Ten thousand, six hundred and ninety-one cows had a steadily rising C.R. up till 180 days *post-partum* and then a slight lowering. The results at 60 to 89 days *post-partum* were significantly better than those at 30 to 59 days *post-partum*.

5. S. Nordlund (Sweden). The conception rate after varying intervals between calving and first insemination.

The author studied 20,193 first inseminations in Swedish Lowland Cattle (Friesian) and observed a steady increase in C.R. up till four months post calving.

6. A. Bane (Sweden). Comparison of the conception rate of the same bull in different districts.

At an A.I. station with five to six bulls only one bull served on each collection day, so that the same semen was sent to the different substations. One bull which had the best results in three of the districts had the worst results in the fourth district. The bull which had the best results in this fourth district had relatively poorer results in the other three districts. Bane suggests that an explanation may be that C.R. does not depend wholly upon a direct sum of the fertility of the male and female but that some interplay between different factors is important in some cases. Genetical and immunological influences are considered.

7. B. Ström (Sweden). Comparison of the conception rate from different ejaculations in the bull.

Each ejaculate was collected and diluted separately. Study of the C.R. from 6,228 inseminations from 16 bulls revealed no significant difference between the fertilising ability of the different ejaculates but there was a slight tendency for the second ejaculate to give better results than the first and third.

8. B. Lundgren (Sweden). Comparison between high and low fertile bulls with reference to the conception rate and length of the oestral cycle of the inseminated cows.

Eighteen bulls were classified as high or low fertile from the results of first inseminations (the border line was 50 per cent. C.R.). The subsequent fertility and length of the oestral cycle of those cows which returned from the first insemination was noted and compared in the cows which had been served by the high fertile bulls with those served by the low fertile bulls. It was clear that some of the low fertility bulls disturbed the cows subsequent fertility. The effect of low fertile bulls on the length of the cycle was variable. The author generalised that the cycle tended to be normal (19 to 23 days) after insemination with poor semen lightly infected, or heavily infected semen. With poor semen the cycle was longer than normal and with lightly infected good semen shorter than normal. One bull was suspected to infect his stall neighbour with *V. foetus*.

9. R. Hagelberg (Sweden). The effect of storage time on semen's fertilising ability.

The C.R. fell on the average 5 per cent. for every 24 hours of storage and varied with different bulls. C.R. from the first day's inseminations had little connection with the ultimate storing ability but results after 33 hours' storage had some connection with the potential length of fertilising life.

10. E. Palsson (Sweden). The age of heifers at their first insemination and its effect on their conception rate in the Swedish Lowland Breed.

Heifers of the Swedish Lowland Breed (Friesians) calve about seven months later than do Freisians in Holland and America. Nearly 90 per cent. of 5,308 heifers studied were served between 17 and 26 months (average 22·8 months). No difference was noted between the C.R. to the first insemination in the different age groups.

11. S. Dahlquist (Sweden). The effect of the age of service on heifers' fertility.

A study of 3,500 heifers in 500 herds of the Swedish Red and White Breed (S.R.B.) gave results similar to Pälsson's above. The peak of the first services was 19 to 20 months. In the discussion the opinion of the speakers from the floor was that heifers which were first mated at over 18 months gave more trouble.

The next nine papers were devoted to enzootic sterility and especially *V. foetus* infection.

12. H. Lund-Larsen (Norway). Campaign against epizootic sterility in Norway.

The control measures being adopted against the outbreak of sterility in Norway are described.

13. J. L. Flatla and M. Braend (Norway). Observations on *Vibrio foetus* infection in cattle.

These authors have studied normally and artificially infected cattle, and have followed the post-abortion blood and vaginal agglutination reactions. They conclude that neither serological reaction is completely satisfactory after abortion and that the vaginal reaction is more persistent.

14. O. Garm, D. Grini and H. Hoff (Norway). Studies of epizootic sterility in cattle in Norway.

Clinical and laboratory studies are reported. The first vibrionic abortion reported in Norway was in October, 1950. The reason for the rapid spread of *Vibrio foetus* infection in Norway was that artificial insemination often is used only on one or two cows in a herd and when these cows return after several inseminations the herd bull is used to serve them. This method resulted in a very rapid spread of vibriosis when *V. foetus*-infected bulls were used in A.I. In the laboratory pregnant guinea-pigs were used as experimental animals.

15. O. Dynna (Norway). Infectious sterility in a practice.

The author considers that *V. foetus* infection has been in his practice for many years and associates its increase with the extension of A.I.

16. L. Szabó (Denmark). Laboratory diagnosis of *V. foetus*.

Blood agglutination test was not satisfactory and the author has had good results with the vaginal agglutination test. To collect mucus for this he uses the tampon method, which gives very satisfactory results.

17. N. O. Rasbech (Denmark). Study of the spreading of *V. foetus* by bulls used in A.I.

Statistical analysis of the results of vaginal agglutination testing in an A.I. district shows which bulls are spreading the disease. Service of several virgin heifers is also recommended as a diagnostic means.

18. K. A. Tevell and P. Viriden (Sweden). Demonstration of *V. foetus* in bull semen.

Isolation of *V. foetus* has been successful in 9·5 per cent. of 293 semen samples and from prepuce and penis of three of five bulls' genital organs. In two cases *V. foetus* was recovered from the prepuce of living bulls.

19. N. Lagerlöf and A. Bane (Sweden). *Vibrio foetus* infection in Sweden.

Vibriosis is part of the symptom complex known as infectious vaginitis. Other known causes are *Trichomonas foetus* infection and spermiocystitis in the bull. Stringent hygiene in all aspects of A.I. work is necessary.

20. V. Rislakki (Finland). Report of *Trichomonas foetus* infection of cattle in Finland.

The last section consisted of five papers on disturbances in the sexual function of bulls.

21. E. Blom and N. O. Christensen (Denmark). A hereditary malformation in the sex organs of the bull.

Seventeen cases of congenital absence of the epididymis, ductus deferens or glandules vesiculares are discussed—(E. Blom & N. O. Christensen, 1951).

22. P. Meschaks (Sweden). The connection between sexual function and the excretion of neutral steroids in the urine of bulls.

The excretion of 17-neutral steroids in 541 urine samples from 54 bulls was examined by the methods of Zimmerman and Pincus. The excretion of 17-ketosteroids in the urine increased from 22·4 mg./litre in normal bulls to 27·9 mg./litre in bulls with reduced serving ability and to 34·5 mg./litre in bulls with disturbed spermatogenesis. Cases which showed both weaknesses excreted 32 7 mg./litre. The two conditions are regarded as different degrees of the same neuro-hormonal disturbance (Meschaks, P., 1951).

23. R. Moberg (Finland). The ages and reasons for disposal of "élite" bulls of the Finnish-Ayrshire breed.

The average age of disposal of 172 "élite" bulls was 11·1 years (from three to 20). The average age of 62 living "élite" bulls was 11·4 (seven to 20) years. The breed has good fertility and durability.

24. A. Kamstad (Sweden). Judging the serving ability and the sperm picture of young bulls of the S.R.B. breed.

The difficulties and methods are described from experience of examination of about 1,000 bulls.

25. K. E. Everz (Sweden). Judging the serving ability and the sperm picture of young bulls of the Swedish Polled Breed (S.K.B.).

Of 417 bulls examined, 296 (71 per cent.) were passed as sexually healthy: 121 (29 per cent.) were condemned. Of these 121, 98 (81 per cent.) showed signs of inability to serve. A young bull should have served 15 to 20 times previous to an attempt being made to judge his serving ability.

References

Blom, E. & Christensen, N. O. (Congenital Absence of the Epididymis, Ductus deferens or Glandula vesicularis (aplasia segmentalis ductus wolfii in the bull). Yearbook 1951. Royal Veterinary and Agricultural College, Copenhagen, Denmark.

Meschaks, P. (On the excretion of neutral steroids in the urine of normal and infertile bulls.) Report of the Ciba Foundation Conference on Hormones and Behaviour. London. April, 1951. In press.

H. B.

SLAUGHTERHOUSE HYGIENE

Mr. G. R. Oake, of the Ministry of Food, Chairman of the Interdepartmental Committee on Meat Inspection, addressing the Sanitary Inspectors' Association annual conference at Margate recently, said (reports the *Meat Trades Journal*) it was clear that the establishment of completely satisfactory conditions of hygiene in slaughterhouses must depend on the replacement or remodelling of a substantial proportion of the premises at present in use. "But I hope we shall not defer action in this matter until the day when perfection can be achieved," he continued. "Even with the present premises some improvement over our present standards should be possible, and I am glad to say that earnest consideration is already being given to these matters inside the Ministry. We must not look for quick results, for in this, as in a great many aspects of hygiene, much depends on public opinion, including the opinion of those most directly concerned in the trade." To judge, however, by the evidence their representatives gave to the Committee, there was a fund of goodwill on these matters.

In the discussion which followed, Mr. C. Ash, senior Meat Inspector for Coventry, suggested that there should be one meat inspector for every 100,000 of the population. Referring to meat transport, Mr. Ash considered that all home-killed meat should be conveyed in a hanging position, and said that no one could convince him that straw was a suitable accompaniment to meat in transit. He recalled that 31 years ago the abolition of open stores for the sale of meat was advocated, and pointed out that it was still only a recommendation to-day.

Alderman T. H. Coles, of Eastleigh, said that the meat boats which used to come from the Argentine prior to the first world war were far cleaner than the vans which now took meat round from shop to shop.

Dr. W. A. Lethem (Ministry of Food) said there was not the slightest doubt that the investigation of outbreaks of food poisoning often pointed suspicion to the consumption of an animal which was never properly inspected at all and which was killed, possibly on a farm, under suspicious circumstances.

The Chairman of the General Council, Mr. C. A. Stansbury, pledged that the Association would back up to the hilt whatever legislation resulted from the Interdepartmental Committee report.

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FOOT-AND-MOUTH DISEASE IN SOUTH AMERICA

F.A.O. reports that following severe outbreaks of foot-and-mouth disease in recent years the Government of Colombia is taking measures to protect its important cattle industry from this scourge.

Advised by two veterinarians of the Food and Agriculture Organisation of the United Nations (Messrs. E. Traub of Germany and W. T. Capps of the U.S.) the Government has built a diagnostic laboratory outside Bogota, where work will be carried on to identify the strains of foot-and-mouth virus active in the country, and produce vaccine for a country-wide vaccination campaign.

Imported Dutch vaccine was found to be of a different strain and immunised only 30 per cent. of cattle vaccinated, as opposed to 83 per cent. success produced by vaccine from the FMD Institute of Venezuela.

A similar disease problem exists in Venezuela and since the disease cannot be dealt with on a purely national basis, Colombia and Venezuela have agreed to form a mixed commission to combat the disease and to propose to other American governments joint action for the eradication of foot-and-mouth disease in the entire American continent.

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The charge for shoeing horses has been increased owing to higher wages and dearer iron and coal. The last increase was in January. In London the price for shoeing a carthorse is now 29s., a riding horse 24s. and a pony 18s. 6d. An extra charge is made for vicious or difficult horses.

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Commonwealth Fund of New York Fellowships.—The Commonwealth Fund of New York has issued its memorandum relating to twenty Fellowships, open to British subjects and tenable in the United States, for the year 1952. Candidates must be degree graduates of a university in the United Kingdom and are required to show a record of marked ability during their university careers and of proficiency in some recognised branch of learning, art or the professions. Particulars as to conditions of tenure, emoluments, applications, etc., are obtainable from the Warden of Harkness House, 35, Portman Square, London, W.1.

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the N.V.M.A.

TUBERCULIN TESTING

Sir,—It is with regret that I note that no one has replied either one way or the other in regard to my suggestion that no cow be condemned unless it fails to pass two consecutive tests.

Even the Ministry Inspectors have had nothing to say either for or against the idea, but I can assure you that unless we do something to help the dairy farmer there will be a great shortage of milk next year.

In my district already some of my clients are selling their dairy cows and changing over to beef and rearing. They are going in for "ranching" their farms but the A.I. centres must take a certain amount of responsibility, because they have not got the cattle in calf at the required times.

Farmers here are putting arable land down to grass and going in for calf rearing and beef and milk is going to be secondary.

The A.I. people and ourselves must give greater assistance to the farmers and encourage them, otherwise we shall soon have a milk famine.—Yours faithfully, G. C. Lancaster, Eastwick House, Evesham, Worcs. *October 2nd*, 1951.

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DISCONTINUANCE OF CLINICAL EXAMINATION OF NON-DESIGNATED (MILK HEAT TREATED) HERDS

Sir,—It has been brought to my notice that the Animal Health Division has decided to give up clinical examination of non-designated herds whose milk is heat treated. I feel this is a retrograde step, as very often owners of these herds are dealers and farmers who would be taking up animals which are reactors from herds trying to get a T.T. licence, and at a rough estimate I should say nine out of ten animals in non-designated herds have tuberculosis in some form.—Yours faithfully, Sidney S. Nye, 230, South Street, Romford, Essex. *October 4th*, 1951.

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TUBERCULOSIS—BOVINE/HUMAN RELATIONSHIP

Sir,—I am interested to learn from his comments on my letter of August 25th that, although he had not drawn attention to the fact, Mr. Pitcher already knew that the death-rate figures from pulmonary tuberculosis in Scotland had shown considerable improvement since his letter of February, 1950.

Since, however, he states that he is more aware of the statistics of notifications, he will have noticed, although again he does not mention them, that those, too, are now showing a very welcome, if less spectacular, downward trend (1949, 8,653; 1950, 8,138; 1951 (first 23 weeks), 4,489, as compared with 4,678 in the corresponding period of 1950).—Yours faithfully, George A. Willis, Royal Veterinary College and Hospital. *October 3rd*, 1951.

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period	Anthrax	Foot-and-mouth	Fowl Pest	Parasitic Mange*	Sheep Scab	Swine Fever
Sept. 1st, to 15th, 1951	12	—	4	—	—	77
Corresponding period in—						
1950	7	1	—	—	1	35
1949	20	—	9	—	4	—
1948	3	1	7	—	6	—
Jan. 1st to Sept. 15th, 1951	311	28	599	—	4	832
Corresponding period in—						
1950	265	20	102	—	20	128
1949	150	13	366	—	33	5
1948	70	1	247	1	39	23

* Excluding outbreaks in Army Horses.